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Marshall Space Flight Center



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Measurement of Dimensions and Alignment with Optical Instruments

For several centuries, navigators, surveyors, and builders have used optical instruments as measuring devices. Today, industry is applying similar techniques in measuring alignment and dimensions of finished products. Indeed, it is not uncommon to encounter products that meet the dimensional requirements of one part in 200,000 regardless of size. To meet such requirements, optical inspection tools are used instead of micrometers, calipers, surface plates, and gauges, particularly in measurements of large components and systems. This technique, called optical tooling, is already in use in the aerospace industry.

To meet increased demands for personnel training in optical tooling, an advanced manual entitled *Optical Alignment* has been published for use as a handbook in conjunction with an advanced optical alignment training course. The course, as contained in this manual, encompasses the principles involved in determining and applying the proper optical tooling devices to fulfill the precise measuring requirements. The information covered by the manual incorporates such subjects as versatility of optical alignment, interpretation of design specifications in relation to optical tooling selections, and tooling limitations. Topics include the following:

1. discussion of design tolerances and references,
2. calibration and test of optical tooling instruments,
3. planning of optical alignment,

4. alignment of jaws which hold down rocket boosters during static firing,
5. determination of the geometric thrust vector for rocket engine alignment by establishing the centroid of the throat and exit areas.
6. alignment of rocket power units,
7. determination of flatness of canted planes, and
8. establishing a true north line by observation of Polaris.

Notes:

1. Information concerning the advanced optical alignment training manual may be of interest to personnel engaged in optical alignment methods such as surveyors, builders, quality control engineers, and test engineers.
2. A more basic training manual on optical alignment is described in Tech Brief 68-10574.
3. Requests for further information may be directed to:
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Source: W. F. Dendy
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(MFS-22168)

Category 06, 03